Annals of Agricultural Science (2014) 59(1), 83–88

HOSTED BY

ELSEVIER

Faculty of Agriculture, Ain Shams University

Annals of Agricultural Science

www.elsevier.com/locate/aoas

ORIGINAL ARTICLE

The economic evaluation of extension activities in forage crops production in Sinai Peninsula, Egypt

A.A. El-Sayd [a,*], M. El-Deep Soha [b]

[a] Agric. Extension Dept., Socio-Economic Studies Division, Desert Research Center, Egypt
[b] Agric. Economic Dept., Socio-Economic Studies Division, Desert Research Center, Egypt

Received 17 December 2013; accepted 20 February 2014
Available online 6 August 2014

KEYWORDS

Improved management practices;
Farm income;
Gross margin;
Extension activities

Abstract Farmers appeared to use more traditional knowledge in Sinai Peninsula; this required a more supportive extension role to help farmers to develop appropriate farming systems. The research was interested to identify the difference in production economics between traditional and improved management practices to reflect the results of extension activities (field days, training courses, and regional farmer field school) in developing the forage crops productivity, knowledge, skills and attitudes of farmers. The research employed surveyed data of 32 selected farmers, and selected farmers were the participated farmers in the project, The analytical tools were used descriptive statistics, gross margin analysis .The results indicated that Several extension activities had been implemented, These activities included field days, training courses, and regional farmer field school. These activities were implemented to introduce improved farm technologies to the farmers as a result of implementing the extension activities. The average net farm income of Egyptian clover, barley, fodder beet, pearl millet and sorghum cultivation under improved practices was 28.3%, 20.07%, 70.2%, 30.01% and 58.02% respectively higher than the cultivation under the traditional practices, and this increment in the net farm income because of all the forage crops productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Introduction

Agriculture is the focal activity of rural areas, and most economic activities related to agriculture development in rural areas can take place through improvements in agricultural inputs and practices.

Populations in Egypt are growing so quickly (92 million people) that the arable lands and the available fresh water are unable to sustain the population increments. Salinity that leads to desertification is a serious problem with crucial impacts on agriculture development in particular in arid and semiarid zones of Egypt. It is believed that cultivation of salt-tolerant crops, using marginal resources such as saline

* Corresponding author.
E-mail address: abo3m2006@yahoo.com (A.A. El-Sayd).

Peer review under responsibility of Faculty of Agriculture, Ain-Shams University.

http://dx.doi.org/10.1016/j.aoas.2014.06.012

soils and irrigation water has significant social and economical potential to solve the problems of food for human being and animal feed shortages and decrease its costs. These plants can grow in saline to extremely saline habitats and have particular characteristics which enable them to evade and/or resist and tolerate salinity by various eco-physiological mechanisms. Such forage crops can constitute a major part of the yearly feeding program of animals since it provides a valuable reserve feed for animals particularly under drought conditions or fill regular gaps in feed supply caused by seasonal conditions. Farmers in Egypt are concerned with ways to prevent salinification and economically produce fodder crops to overcome the problems of crucial feed shortage leading to high feeding costs particularly in desert areas particularly during the dry seasons. It is worthy to note that the livestock sector plays a significant economic role in most regions of Egypt, and is essential for the food security of their rural population. It contributes to poverty alleviation and provides elements that are essential to the national economy, such as: food, fiber, leather, bank savings, by generating significant household cash income through sales of live animals or livestock products. For smallholder farmers and Bedouins with limited production capacity, it is important to find enough animal feeds all over the year to maintain good production and reproductive performance. Many farmers are forced to buy hay, concentrates or silage just to keep their animals alive and are unable to benefit due to the higher prices paid for animal feed.

Objectives

The objectives were to

- Identify the socio-economic farmers characteristics.
- Identify the extension activities used by extension agents.
- Assess production economics for the forage crops grown under traditional management practices.
- Assess production economics for the forage crops grown under improved management practices which introduced to the farmers by extension agents and difference in production economics between traditional and improved management practices to reflect the results of educational extension activities in developing the forage crops productivity, knowledge, skills and attitudes of farmers.

Data and methodology

The sample was purposively selected, the study employed surveyed data of 32 project participated farmers, a well structured interview schedule was used to collect data based on the socio-economic variables such as age, farm size, educational status, costs and returns, and information about implemented extension activities.

Study area

Sahl El-Tina is an important area in Sinai Peninsula, Egypt. It was selected to represent marginal ecosystem. The irrigation water was obtained from mixed water (Nile water + drainage waters) of El Salam Canal. The soil is characterized by severe salt affected, differ in depth and stratified profile layers. The activities started in 2011/2012 winter season. The soil salinity and salinity of irrigation water for these farms varied between 12.5–15.6 dS/m and 1.6–2.3 dS/m (1000–1100 mg/L), respectively. In addition, the poverty and inappropriate management practices beside the marginal soil and water resources are the problems of agriculture development in this area.

Analytical technique

The analytical tools that were used for this include descriptive statistics, gross margin analysis and extension activities (field days, training courses, and regional farmer field school).

Descriptive statistics

The descriptive statistics that employed includes frequencies, percentages and ratios. This was used to analyze the socio-economic characteristics of the farmers.

Gross margin analysis

Gross margin analysis is by definition the difference between the gross farm income and total variable cost (Olukosi and Erhabour, 1988). Normally, gross margin analysis was used to assess production economics for the forage crops grown under traditional and improved management practices which introduced to the farmers through extension activities and to test the effects of changes that do not alter the fixed cost of production, especially the cost of land and other durable factors. It was used to determine the potential profitability and effect on farmer's farm income under traditional and improved management practices. It had the advantage of being simple as well as useful in the analysis of the profitability of small farms that have small fixed costs (Samm, 2009).

The gross margin analysis was estimated from costs and returns in forage crops production.

Gross margin model is expressed as follows:

$$GM = TR - TVC$$

where

GM = gross margin (LE/ha).

TR = total revenue or total value of output from the forage crops (LE/ha) It is the product of average output per hectare multiplied by the market price.

TVC = total variable cost or the costs that are specific in producing (forage crops) output (LE/ha).

TVC varies according to output and are incurred on variable inputs.

This includes cost of inputs like seeds, fertilizer, and harvesting, labor cost (hired/family).

Results and discussion

Table 1 shows the distribution of farmers by personal and socio-economic characteristics. Majority (34.4%) of the farmers fell in the age greater than 40 years, (31.3%) were 35 years and below while 31.3% were between 35 and 40 years.

Majority (84.4%) of the farmers were married and have children, and 15.6% were single. About 37.5% of the farmers

Table 1 Distribution of farmers by their personal and socio-economic characteristics. *Source:* Questionnaire data, 2012.

Variable	Description	Frequency	Percentage
Age	Less than 35 years	10	31.3
	Between (35 and 40) year	10	31.3
	Greater than 40 year	12	34.4
	Total	32	100
Education status	Non-education	9	28.13
	Read and write	4	12.5
	Primary education	1	3.13
	Preparatory education	4	12.5
	Technical education	12	37.5
	University education	2	6.25
	Total	32	100
Marital status	Married and have children	27	84.4
	Married and has no children	–	–
	Single	5	15.6
	Divorced or widowed	–	–
	Total	32	100
Number of family members	Less than 4 members	5	15.6
	Between 4 and 9 members	27	84.4
	Greater than 9 members	–	–
	Total	32	100
Number of animals' heads	Less than 5 heads	18	56.3
	Between 5 and 9 heads	8	25
	Greater than 9 heads	6	18.7
	Total	32	100
Farm size	Less than 2 ha	12	37.5
	Between 2 and 4 ha	12	37.5
	Greater than 4 ha	8	25
	Total	32	100

had technical education, (28.13%) had non-education at all while 12.5% of the farmers read and write, and 12.5% had Preparatory education but 6.25% of the farmers had University education, about 37.5% of the farmers had their farm size less than 2 ha, 37.5% had their farm size between 2 and 4 ha and about (25%) had farm size greater than 4 ha.

Majority (84.4%) of the farmers had family size between 4 and 9 members and 15.6% had family size less than 4 members. About 56.3% of farmers had less than 5 animals' heads, 25% had between 5 and 9 animals' heads and about 18.7% had greater than 9 animals' heads.

The result showed that majority of the Farmers are middle-aged, married, and had technical form of education or the other with average years experience. The result implies that all these variables would serve as a guide to the extension agents to determine which of the methods is used for particular group of farmers.

Several extension activities had been implemented. These activities included field days, training courses, and regional farmer field school. These activities were implemented to introduce an improved farm technology to the farmers.

These activities were presented in more detail as follows.

Field days

This activity was implemented two times to disseminate the Package of efficient forage production for marginal environment that improved climate change at Farms levels to refine and finalize the management practice packages as well as improved integrated water management through improved water use efficiency.

Table 2 shows that, the number of all attendees was increased from 37 farmers in the first field day to 59 farmers in the second field day and also the number of in direct beneficiaries was increased from 15 to 27 farmers which reflects the interests of farmers.

Training courses

A training course was implemented on the techniques of management and use of natural resources under salt affected lands in Northern Sinai.

Table 3 shows that, the implementation place was in Extension center – Sahl El-Tina, Course duration was 3 days, Number of lecturers was 12, number of all attendees was 60 and the topics were about insects, pesticides, irrigation systems, crop patterns, seed production, feed blocks, and dairy products. The targets from this training course were to improve the farmers' skills and solve their problems.

Table 2 Some information on the field days. *Source:* Questionnaire data, 2012.

Item	First field day	Second field day
Number of all attendees	37	59
Number of direct beneficiaries	22	32
Number of in direct beneficiaries	15	27

Table 3 Some information on the training course. *Source:* Questionnaire data, 2012.

Item	Sahl El-Tina
Implementation place	Extension center-Sahl El-Tina
Course duration	3 days
Number of lecturers	12
Number of all attendees	60
Agr-extension agents	8
Number of direct beneficiaries	32
Number of in direct beneficiaries	20

The regional farmer field school

Regional farmer field school was organized to help farmers to discover many aspects of crop management through regular field observation, sharing and learning from their collective experiences. Egyptian Farmers indicated that they would invite other farmers to participate and attend farmer field school sessions for the following reasons:

(1) Farmer field school facilitated learning and farmers improved their crop knowledge and skills.
(2) Farmers learnt by doing and from the experiences of other farmers.
(3) Participants were motivated by other farmers and it made learning interesting.
(4) It was enjoyable and easy.

After implementing the extension activities, an economic study was carried out to compare the gross margin of different forage crops grown under both improved management practices which introduced to the farmers through the extension activities and traditional management practices, and economic evaluation was carried out for five crops (three winter crops and two summer crops).

Winter season

Economic evaluation was carried out for three crops (Egyptian clover, barley, and fodder beet).

Egyptian clover

Table 4 indicates that, the costs incurred on various resources used and the profits obtained from the sales of the produce were estimated based on the market price at the period under consideration.

A gross return was calculated by multiplying the total quantity of produce harvested by the price of output sold. The average gross return for the plots that received improved agriculture practices is 25,200 LE/ha and 21,840 LE/ha for the plots that received traditional agriculture practices.

For cost of production, total variable cost and total fixed cost were considered in order to calculate the total cost of production. The total variable cost includes cost of labor, chemicals, fertilizer and seeds while total fixed costs include cost of renting land, and depreciation on farm tools. The straight line method, which assumed a constant rate of annual depreciation, was used to calculate the depreciation on farm tools.

Table 4 Gross margin and returns for Egyptian clover. *Source:* Questionnaire data, 2012.

Item	Improved practices (LE/ha)	Traditional practices (LE/ha)
Total revenue	25,200	21,840
Input costs	5081	4800
Equipment Operating Costs	1100	1100
Labor	3919	3800
Total variable cost	10,100	9700
Gross margin	15,100	12,140
Total fixed cost	1700	1700
Net Farm Income/profit (NFI)	13,400	10,440

The labor used consists of family, hired labor. The wage rate varies slightly depending on the operation to be performed on the farm. The average wage rate of wage is 50 LE/man-day which was used to calculate the total labor cost. The total cost of labor accounts for 38.8% of the variable cost for the plots that received improved agriculture practices and 39.2% for the plots that received traditional agriculture practices. The cost of the total production inputs was 5081 LE/ha for the plots that received improved agriculture practices and 4800 LE/ha for the plots that received traditional agriculture practices, the Equipment Operating Costs were 1100 LE/ha for all the plots that received improved and traditional agriculture practices.

The average net farm income of Egyptian clover cultivation under improved practices was 28.3% higher than the cultivation under the traditional practices, and this increment because of the Egyptian clover productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Barley

Table 5 shows that, the average gross return for the plots that received improved agriculture practices was 17,500 LE/ha and 15,000 LE/ha for the plots that received traditional agriculture practices. The average wage rate of wage is 50 LE/man-day which was used to calculate the total labor cost. The total cost of labor accounts for 38.6% of the variable cost for the plots

Table 5 Gross margin and returns for Barley. *Source:* Questionnaire data, 2012.

Item	Improved practices (LE/ha)	Traditional practices (LE/ha)
Total revenue	17,500	15,000
Input costs	3850	3135
Equipment Operating Costs	950	950
Labor	3030	2615
Total variable cost	7830	6700
Gross margin	9670	8300
Total fixed cost	1700	1700
Net Farm Income/profit (NFI)	7970	6600

that received improved agriculture practices and 39% for the plots that received traditional agriculture practices.

The cost of the total production inputs was 3850 LE/ha for the plots that received improved agriculture practices and 3135 LE/ha for the plots that received traditional agriculture practices.

The Equipment Operating Costs were 950 LE/ha for all the plots that received improved and traditional agriculture practices.

The average net farm income of Barley cultivation under improved practices was 20.7% higher than the cultivation under the traditional practices, and this increment because of the Barley productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Fodder beet

Table 6 presents that, the average gross return for the plots that received improved agriculture practices was 22,500 LE/ha and 18,500 LE/ha for the plots that received traditional agriculture practices. The average wage rate of wage is 50 LE/man-day which was used to calculate the total labor cost. The total cost of labor accounts for 37.5% of the variable cost for the plots that received improved agriculture practices and 37.2% for the plots that received traditional agriculture practices.

The cost of the total production inputs was 6900 LE/ha for the plots that received improved agriculture practices and 6500 LE/ha for the plots that received traditional agriculture practices.

The Equipment Operating Costs were 1100 LE/ha for all the plots that received improved and traditional agriculture practices.

The average net farm income of fodder beet cultivation under improved practices was 70.2% higher than the cultivation under the traditional practices, and this increment because of the fodder beet productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Summer season

Economic evaluation was carried out for two crops (sorghum and pearl millet).

Pearl millet

Table 7 indicates that, the average gross return was 25,600 LE/ha for the pearl millet areas that were cultivated after implementing extension activities and 20,400 LE/ha for the areas that were cultivated before implementing extension activities. The average wage rate of wage is 50 LE/man-day which was used to calculate the total labor cost. The total cost of labor accounts for 27.5% of the variable cost for the plots that received improved agriculture practices and 19.9% for the plots that received traditional agriculture practices, and the cost of the total production inputs was 5900 LE/ha for the plots that received improved agriculture practices and 5285 LE/ha for the plots received that traditional agriculture practices. The Equipment Operating Costs were 1200 LE/ha for all the plots that received improved and traditional agriculture practices.

The average net farm income of pearl millet cultivation under improved practices was 33.01% higher than the cultivation under traditional practices, and this increment because of the pearl millet productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Sorghum

Table 8 shows that, the average gross return for the sorghum areas that were cultivated after implementing extension activities was 24,000 LE/ha and 18,000 LE/ha for the areas that were cultivated before implementing extension activities. The average wage rate of wage is 50 LE/man-day which was used to calculate the total labor cost. The total cost of labor accounts for 28.4% of the variable cost for the plots that received improved agriculture practices and 23.3% for the plots that received traditional agriculture practices. The cost of the total production inputs was 5500 LE/ha for the plots that received improved agriculture practices and 4985 LE/ha for the plots that received traditional agriculture practices, and the Equipment Operating Costs were 1300 LE/ha for all the plots that received improved and traditional agriculture practices.

The average net farm income of sorghum cultivation under improved practices was 58.02% higher than the cultivation under traditional practices and extension activities and this increment because of the sorghum productivity cultivation

Table 6 Gross margin and returns for fodder beet. *Source:* Questionnaire data, 2012.

Item	Improved practices (LE/ha)	Traditional practices (LE/ha)
Total revenue	22,500	18,500
Input costs	6900	6500
Equipment Operating Costs	1100	1100
Labor	4800	4500
Total variable cost	12,800	12,100
Gross margin	9700	6400
Total fixed cost	1700	1700
Net Farm Income/profit (NFI)	8000	4700

Table 7 Gross margin and returns for pearl millet. *Source:* Questionnaire data, 2012.

Item	Improved practices (LE/ha)	Traditional practices (LE/ha)
Total revenue	25,600	20,400
Input costs	5900	5285
Equipment Operating Costs	1200	1200
Labor	2700	1615
Total variable cost	9800	8100
Gross margin	15,800	12,300
Total fixed cost	1700	1700
Net Farm Income/profit (NFI)	14,100	10,600

Table 8 Gross margin and returns for sorghum. *Source:* Questionnaire data, 2012.

Item	Improved practices (LE/ha)	Traditional practices (LE/ha)
Total revenue	24,000	18,000
Input costs	5500	4985
Equipment Operating Costs	1300	1300
Labor	2700	1915
Total variable cost	9500	8200
Gross margin	14,500	9800
Total fixed cost	1700	1700
Net Farm Income/profit (NFI)	12,800	8100

under improved practices was higher than the productivity cultivation under traditional practices.

After implementing extension activities, Farmers had discovered many aspects of improved forage crop management in through regular field observation, logical inference, sharing and learning from their collective experiences. They found that their time was not wasted since they learnt things that enabled them to save them money or helped them to obtain greater yields, and they learnt that applying improved forage crop management based on observation and identification was beneficial.

Conclusion

Agricultural extension is the conscious provision of information and communication support to rural users of renewable natural resources. It involves offering advice, helping farmers to analyze problems and identify opportunities, sharing information, supporting group formation and facilitating collective action. Farmers appear to use more traditional knowledge in Sahl El Tina. This is required a more supportive extension role to help farmers to develop appropriate farming systems. There was relatively little information available through the extension activities to help farmers to decide how to improve the sustainability of their farming practice.

Several extension activities such as field days, training courses, and regional farmer field school were powerful tools for exchanging views and sharing information within a Sahl El-Tina population The research employed surveyed data of 32 selected farmers. The analytical tools that were used include descriptive statistics, gross margin analysis. The results indicated that, the extension activities were implemented to introduce an improved farm practice to the farmers. as a result of implementing these extension activities, and an economic study was carried out to compare the net farm income of different forage crops grown under both improved management practices which introduced to the farmers through the extension activities and traditional management practices, The average net farm income of Egyptian clover, barley, fodder beet, pearl millet and sorghum cultivation under improved practices was 28.3%, 20.07%, 70.2%, 30.01% and 58.02% respectively higher than the cultivation under the traditional practices, and this increment in the net farm income because of all the forage crops productivity cultivation under improved practices was higher than the productivity cultivation under traditional practices.

Recommendations

Based on the results of the study

1. Dissemination of fodder crops introduced by the project, according to the recommendations of the research team project.
2. Future reliance on outreach activities that have proven their effectiveness in communicating with a study area farmers' field schools and field days because of these activities of educational and social impact effectively.
3. Activate and expand the role of the extension, so that it can play its role assigned to it in the development and improve and increase the knowledge, information and skills production and marketing of farmers in study aria.
4. Conducting similar studies extend to all agricultural crops tolerant to salinity of the Sinai Peninsula so that in light of the development of real indicators for integrated outreach programs be the main objective to increase the agricultural area, improve and increase the productivity of these crops.
5. Studies and future research, which aims to disseminate the forage crops tolerant to salinity should be interested in studying the personal variables and attitudinal as well as the various factors which are not covered by this study, which could have an impact on production and marketing.

Acknowledgment

The research presented in this paper had been done as a part of the project (Adaptation to climate change in WANA marginal environments through sustainable crop and livestock diversification). The researchers are thankful to the regional coordinator of the project Dr/Hassan el shaer for his supporting and express their deep gratitude to each and every member of the Egyptian team work for providing very useful technical information for this research.

References

Olukosi, J.O., Erhabour, P.O., 1988. Introduction to Farm Management Economics Principles and Applications. AGITAB Publishers Ltd Zaria, Nigeria.

Samm, B.M., 2009. Gross margin analysis and linear programming; Tools in understanding how farmers in the guinea savannah region of Nigeria rejected the most profitable type of sorghum recommended by scientists. In: Proceedings; pre-conference of the Western Agricultural Economics Association 2009 meeting. June 24:1–20.